Geometry Workbook Solutions

Area and perimeter

krista king MATH

AREA OF A RECTANGLE

■ 1. The base of a rectangle is 8 feet. Find its height if the area of the rectangle is 80 ft^2.

Solution:

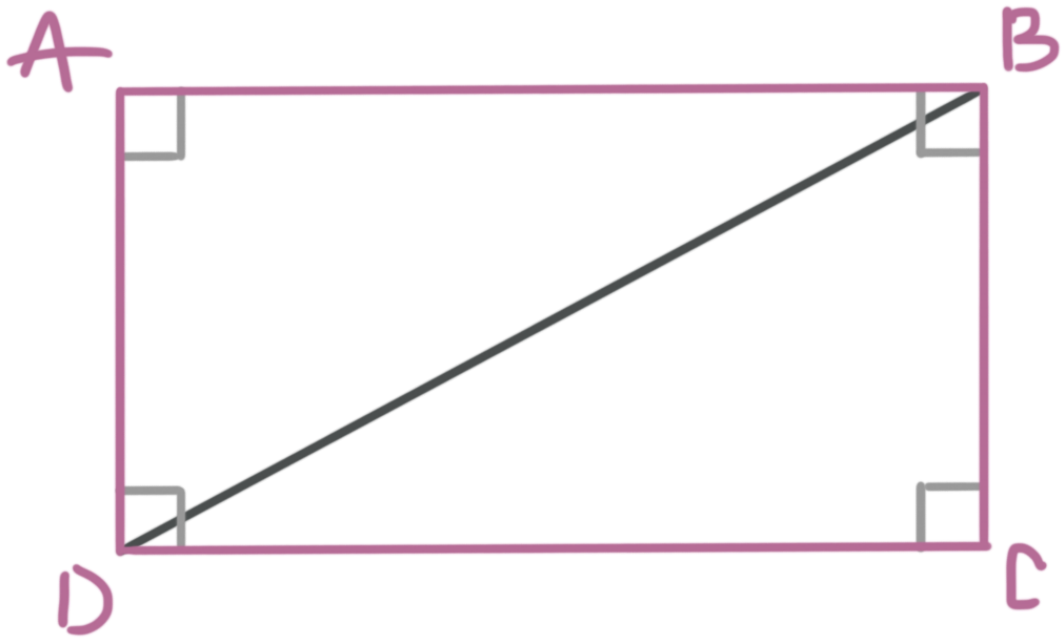
$h = 10$ feet. We can use the formula for the area of the rectangle to plug in everything we know, and then solve for the height.

$$A = bh$$

$$80 = 8h$$

$h = 10$ feet

■ 2. In rectangle $ABCD$, $BD = 13$ and $AB = 12$. Find the area of this rectangle.



© Krista King Math

Solution:

60 square units. Use the Pythagorean Theorem to find the length of $\overline{AD}$.

$$AD^2 + AB^2 = BD^2$$

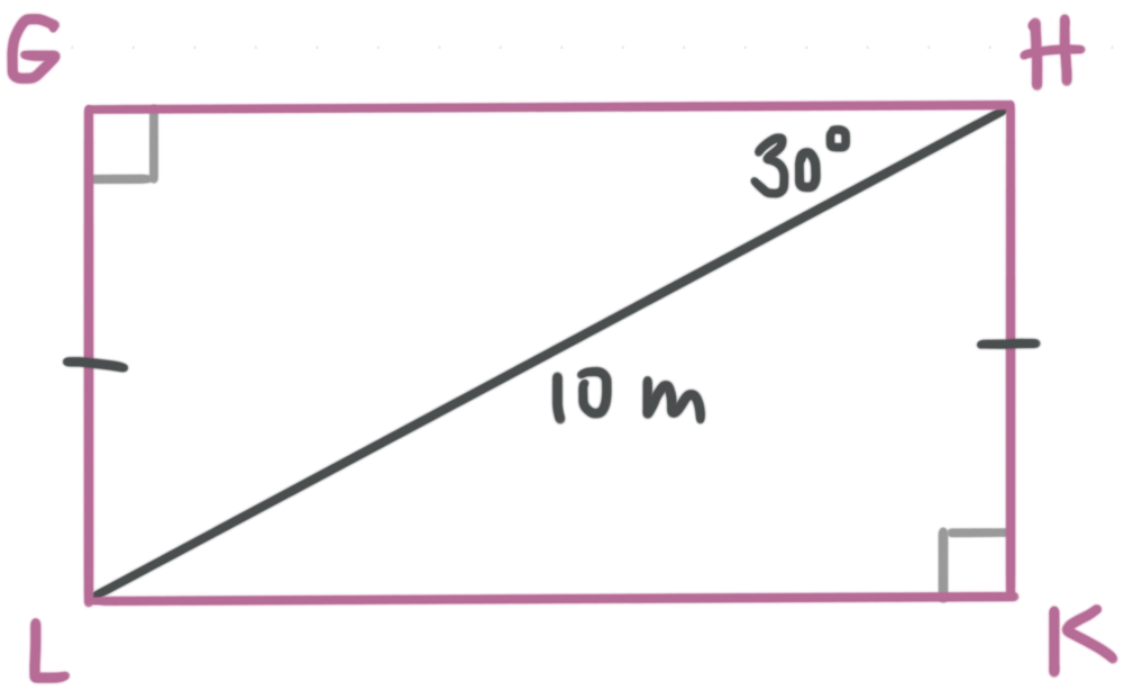
$$AD^2 + 12^2 = 13^2$$

$$AD^2 = 25$$

$$AD = 5$$

Therefore, the area of the rectangle is $A = bh = (5)(12) = 60$.

■ 3. In rectangle $GHKL$, $LH = 10$ and $m\angle GHL = 30$. Find the exact area of the rectangle.



© Krista King Math

Solution:

$25\sqrt{3}$. $\triangle GHL$ is a special right triangle with degree measures $30 - 60 - 90$. The diagonal of the rectangle is 10 and is the hypotenuse of $\triangle GHL$. The shortest leg of the triangle is $\overline{GL}$ and this side is half the length of the hypotenuse. $GL = 5$ and $\overline{GH}$ is the product of the shorter leg and $\sqrt{3}$. Therefore, $GH = 5\sqrt{3}$. The area of the rectangle is

$$A = bh = (5)\left(5\sqrt{3}\right) = 25\sqrt{3}$$

■ 4. The area of a small square flower garden is 49 ft^2. Suppose we wish to make the garden bigger by adding 6 feet to one of the sides. How much more square footage is available in this new rectangular garden?

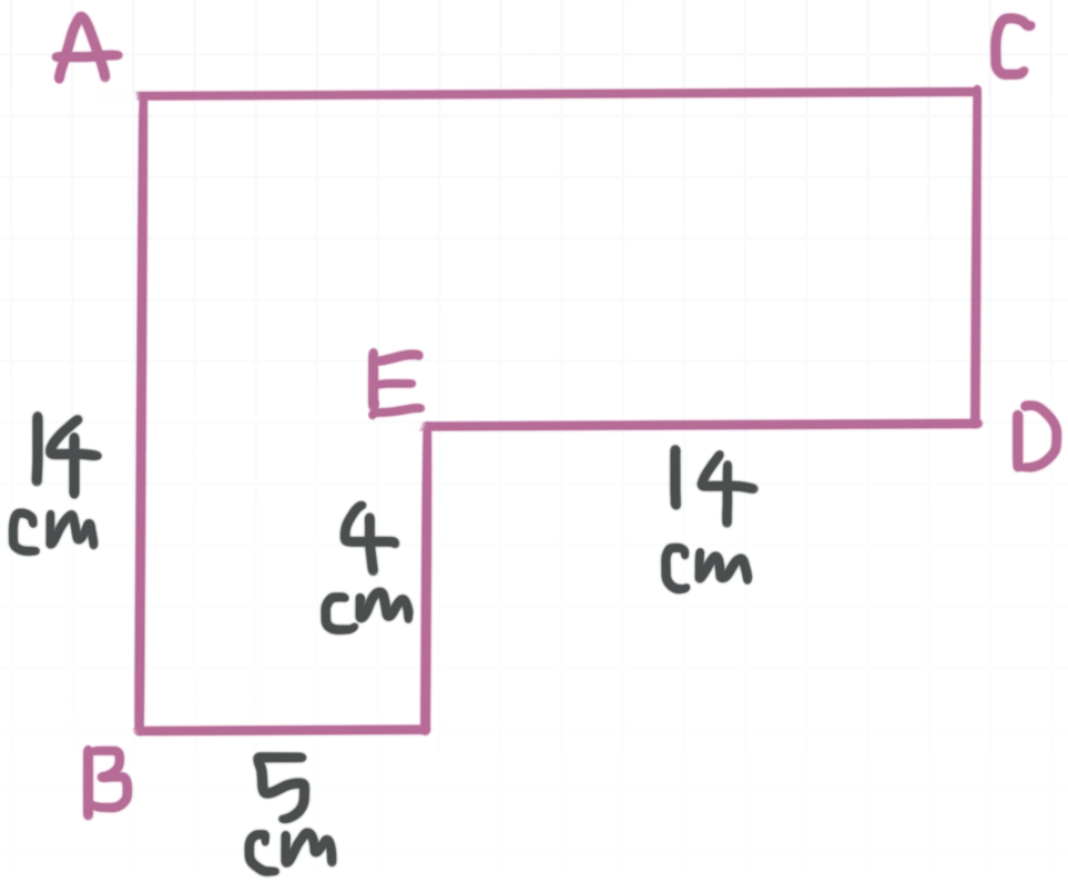
Solution:

42 ft^2. The original square garden has dimensions 7 feet by 7 feet. By adding 6 feet onto one of the sides, we get a new rectangle with dimensions 13 feet by 7 feet. The new garden has an area of $(13)(7) = 91$ ft^2. To find the area gained, take $91 - 49 = 42$ ft^2.

© Krista King Math

AREA OF A RECTANGLE USING SUMS AND DIFFERENCES

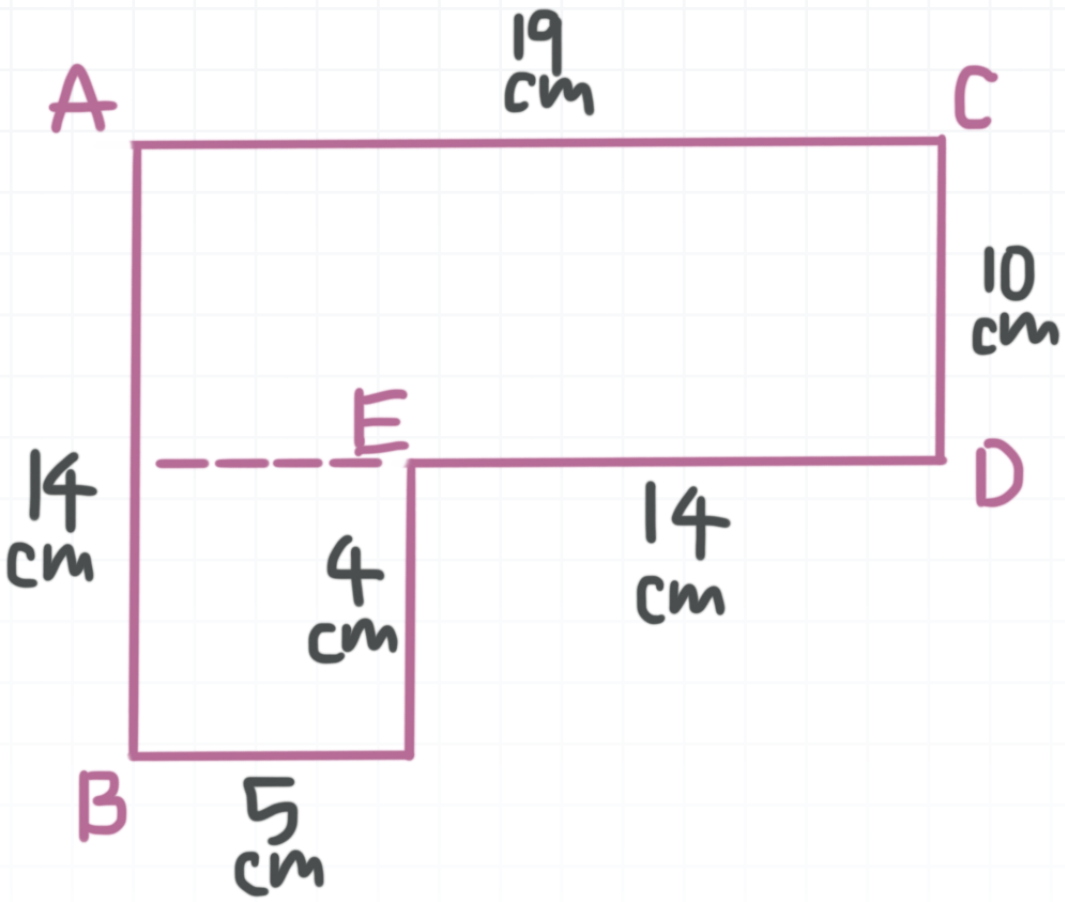
■ 1. Find the area of the figure.



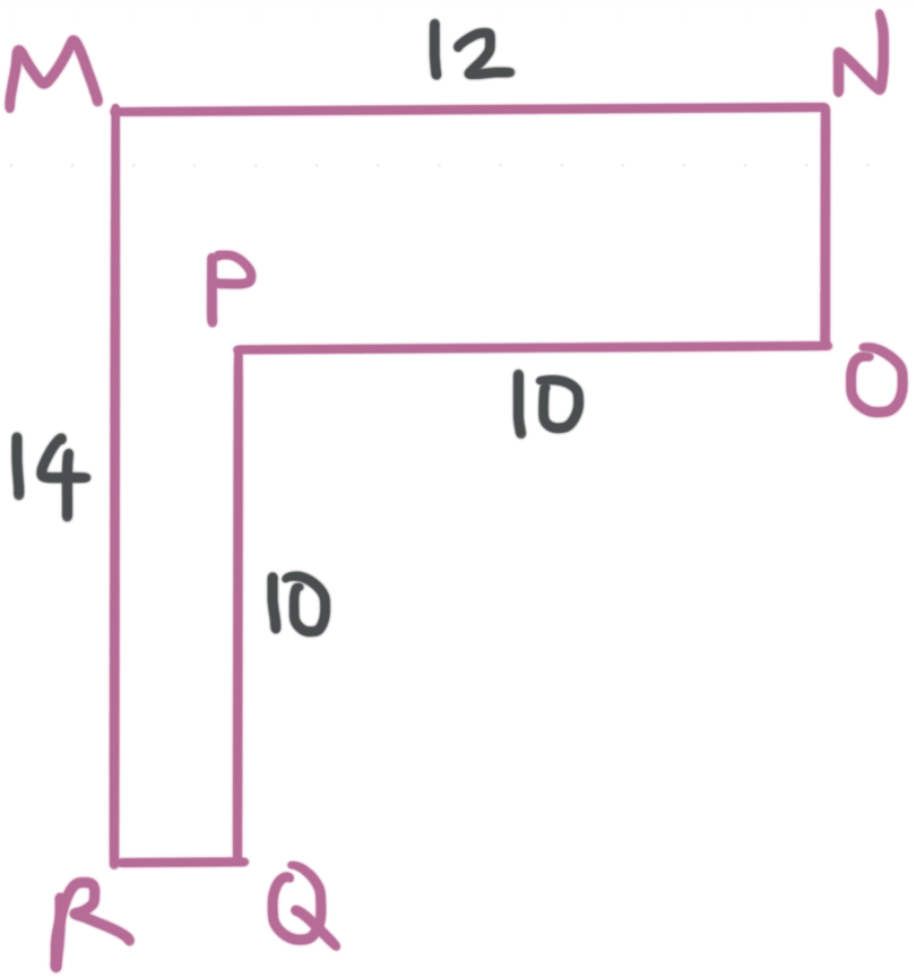
Solution:

210 cm^2

© Krista King Math



2. Find the area of the figure.

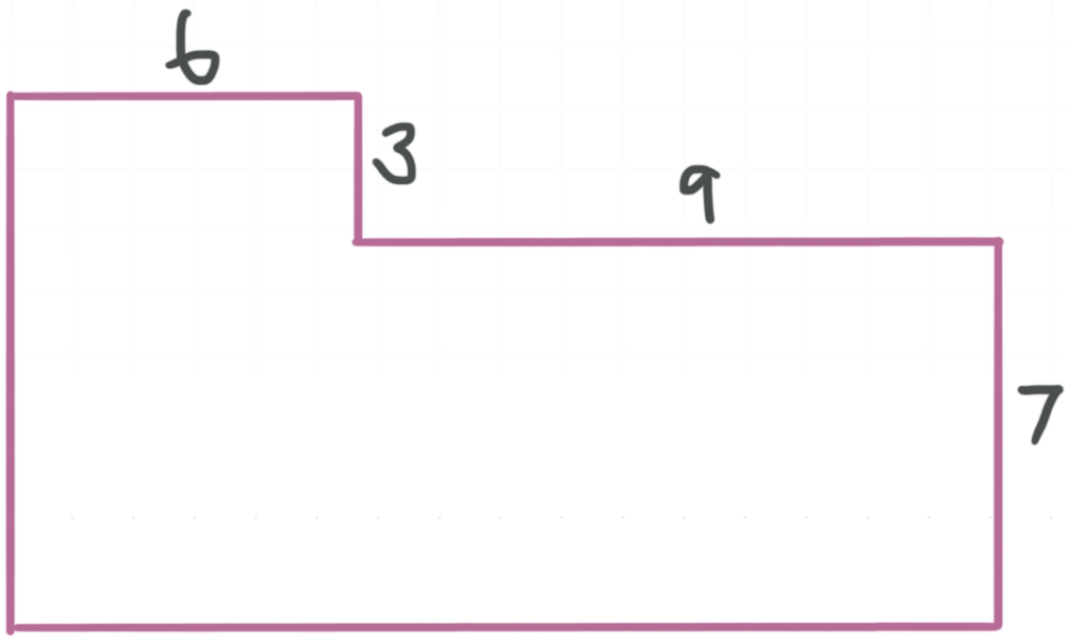


© Krista King Math

Solution:

68 square units. The area of larger rectangle with three vertices at M, N, and R is $A = (14)(12) = 168$. The area of the smaller rectangle with three vertices at P, O, and Q is $A = (10)(10) = 100$. Using the difference method, the area of the figure is $168 - 100 = 68$.

■ 3. Find the area of the figure.

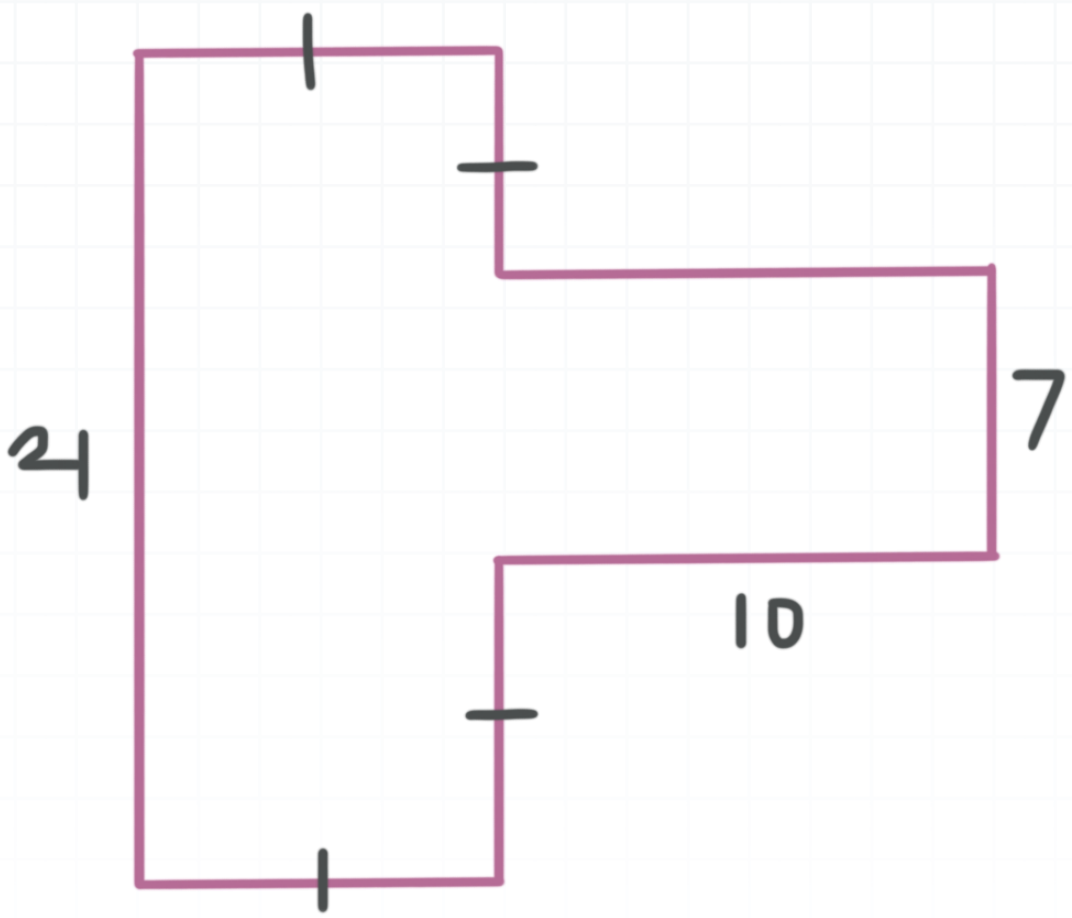


Solution:

123 square units. The area of the little rectangle in the upper left is $A = (6)(3) = 18$. The area of the larger rectangle at the bottom is $A = (6 + 9)(7) = 105$. Using the sum method, the area of the figure is $18 + 105 = 123$.

© Krista King Math

4. Find the area of the figure.



Solution:

217 square units. The area of the rectangle on the left is $A = (21)(7) = 147$. The area of the rectangle on the right is $A = 10(7) = 70$. Using the sum method, the area of the figure is $A = 147 + 70 = 217$.

© Krista King Math

PERIMETER OF A RECTANGLE

■ 1. A rectangle has a base of 10 meters. The height is 4 meters greater than the base. Find the perimeter of this rectangle.

Solution:

48 meters. By the formula for the perimeter of a rectangle, we get

$$P = 2b + 2h$$

$$P = 2(10) + 2(10 + 4)$$

$$P = 20 + 18$$

$$P = 48$$

■ 2. The area of a rectangle is 40 ft^2. Find the perimeter of this rectangle if the length of the rectangle is 3 feet longer than the width.

Solution:

26 feet. First, we'll write the equation for the area and plug in what we know.

$$A = bh$$

© Krista King Math

$$40 = b(b + 3)$$

$$40 = b^2 + 3b$$

$$0 = b^2 + 3b - 40$$

$$0 = (b + 8)(b - 5)$$

$$b = -8, 5$$

The base of the rectangle can't be defined by a negative number, so the base must be 5 feet long. The height is therefore $h = 5 + 3 = 8$ feet, and the perimeter is

$$p = 2b + 2h$$

$$p = 2(5) + 2(8)$$

$$p = 10 + 16$$

$$p = 26$$

■ 3. Find the perimeter of a rectangle with vertices at $A(-3,0)$, $B(0,4)$, $C(4,1)$, and $D(1,-3)$.

Solution:

© Krista King Math

20 units. We need to use the distance formula to calculate the distance between adjacent points, which will give us the length of each side of the rectangle.

$$d_{AB} = \sqrt{(4-0)^2 + (0-(-3))^2} = 5$$

$$d_{BC} = \sqrt{(1-4)^2 + (4-0))^2} = 5$$

$$d_{CD} = \sqrt{((-3)-1)^2 + (1-4)^2} = 5$$

$$d_{AD} = \sqrt{(-3)-0)^2 + (1-(-3))^2} = 5$$

Therefore, the perimeter is

$$p = AB + BC + CD + AD$$

$$p = 5 + 5 + 5 + 5$$

$$p = 20$$

■ 4. Find the value of x if the base of the rectangle has length $x + 4$, the height of the rectangle is x, and the perimeter of a rectangle is 20 units.

Solution:

$x = 7$. Plug what you know into the formula for the perimeter of a rectangle.

© Krista King Math

$$P = 2b + 2h$$

$$P = 2(x) + 2(x - 4)$$

$$20 = 2(x) + 2(x - 4)$$

$$20 = 4x - 8$$

$$28 = 4x$$

$$x = 7$$

© Krista King Math

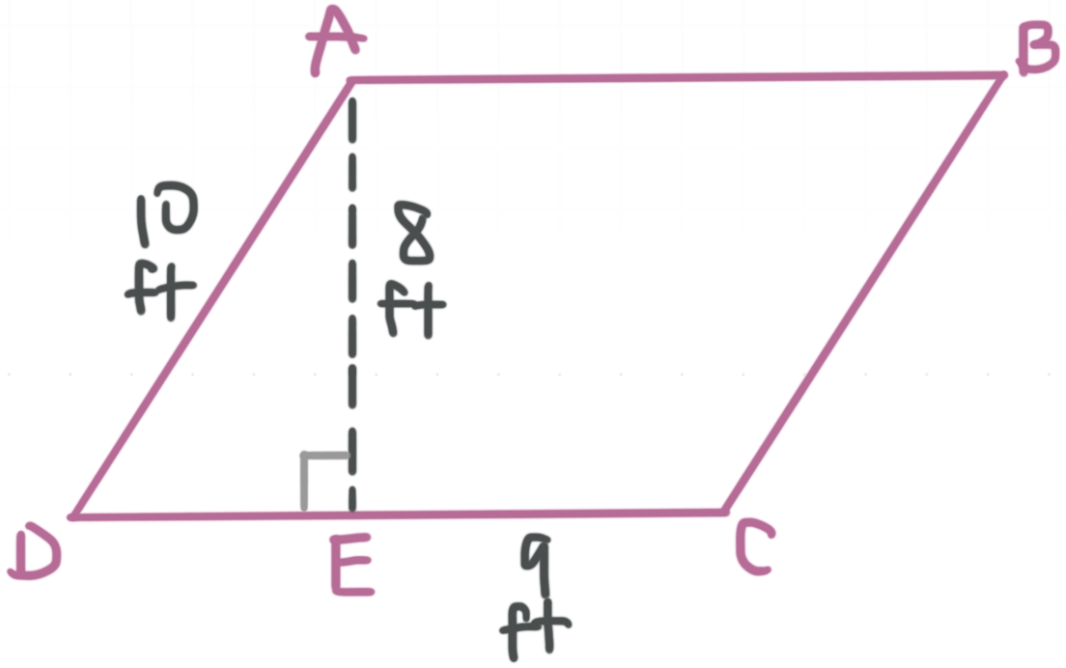
AREA OF A PARALLELOGRAM

■ 1. Find the area of a parallelogram with $b = 14$ yards and $h = 10$ yards.

Solution:

140 yd^2

■ 2. Find the area of the parallelogram.



Solution:

120 ft^2. Find the missing side, ED, of the right triangle using Pythagorean Theorem.

© Krista King Math

$$ED^2 + 8^2 = 10^2$$

$$ED = 6$$

Find the length of the base of the parallelogram, $\overline{DC}$.

$$DC = 6 + 9$$

Then the area is

$$A = bh = (15)(8) = 120$$

■ 3. Find the area of parallelogram $JKLM$, if $J(0,0)$, $K(1,3)$, $L(-5,3)$, and $M(-6,0)$.

Solution:

18. Graph the parallelogram and find the base and height. The base is $b = 6$ and the height is $h = 3$. Then the area is

$$A = bh = (6)(3) = 18$$

■ 4. A parallelogram has a base that is 3 feet longer than it is tall. The area of the parallelogram is 88 square feet. Find the height of the parallelogram.

Solution:

© Krista King Math

8 feet. Using the equation for area, we can find the height.

$$A = bh$$

$$88 = (h + 3)(h)$$

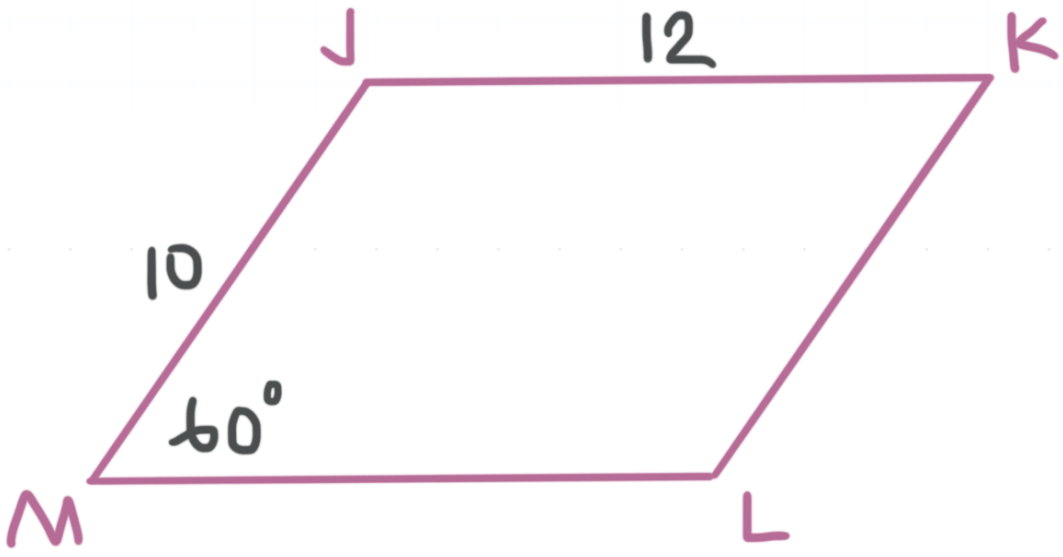
$$88 = h^2 + 3h$$

$$0 = h^2 + 3h - 88$$

$$0 = (h + 11)(h - 8)$$

$$h = 8$$

■ 5. Find the exact area of the parallelogram.



Solution:

© Krista King Math

$60\sqrt{3}$. The height forms a right angle with the base. A $30-60-90$ triangle is formed with 10 as its hypotenuse. The height can be found by applying $30-60-90$ rules to get $h=5\sqrt{3}$. Then the area is the parallelogram is

$$A=bh=12(5\sqrt{3})=60\sqrt{3}$$

© Krista King Math

AREA OF A TRAPEZOID

■ 1. Find the area of a trapezoid with base lengths 16 and 18, and height 10.

Solution:

170. If we plug what we've been given into the formula for the area of a trapezoid, we get

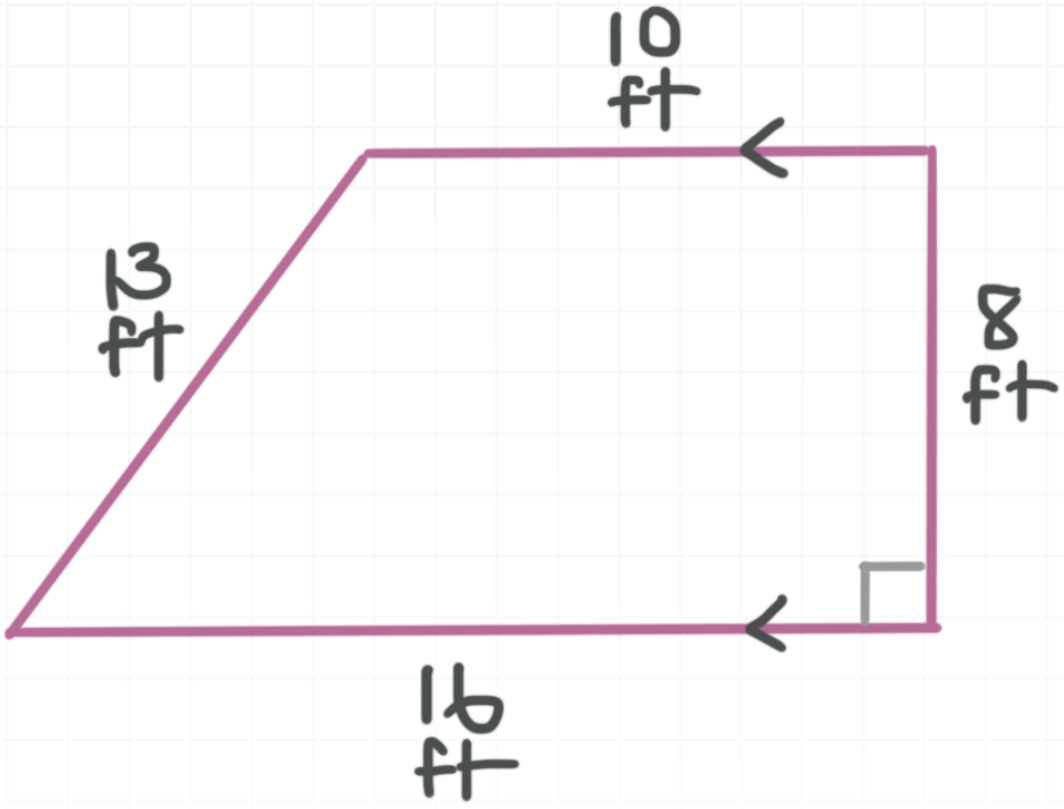
$$A = \frac{1}{2}(\text{height})(\text{base}_1 + \text{base}_2)$$

$$A = \frac{1}{2}(10)(16 + 18)$$

$$A = 170$$

■ 2. Find the area of the trapezoid.

© Krista King Math



Solution:

104. If we plug what we've been given into the formula for the area of a trapezoid, we get

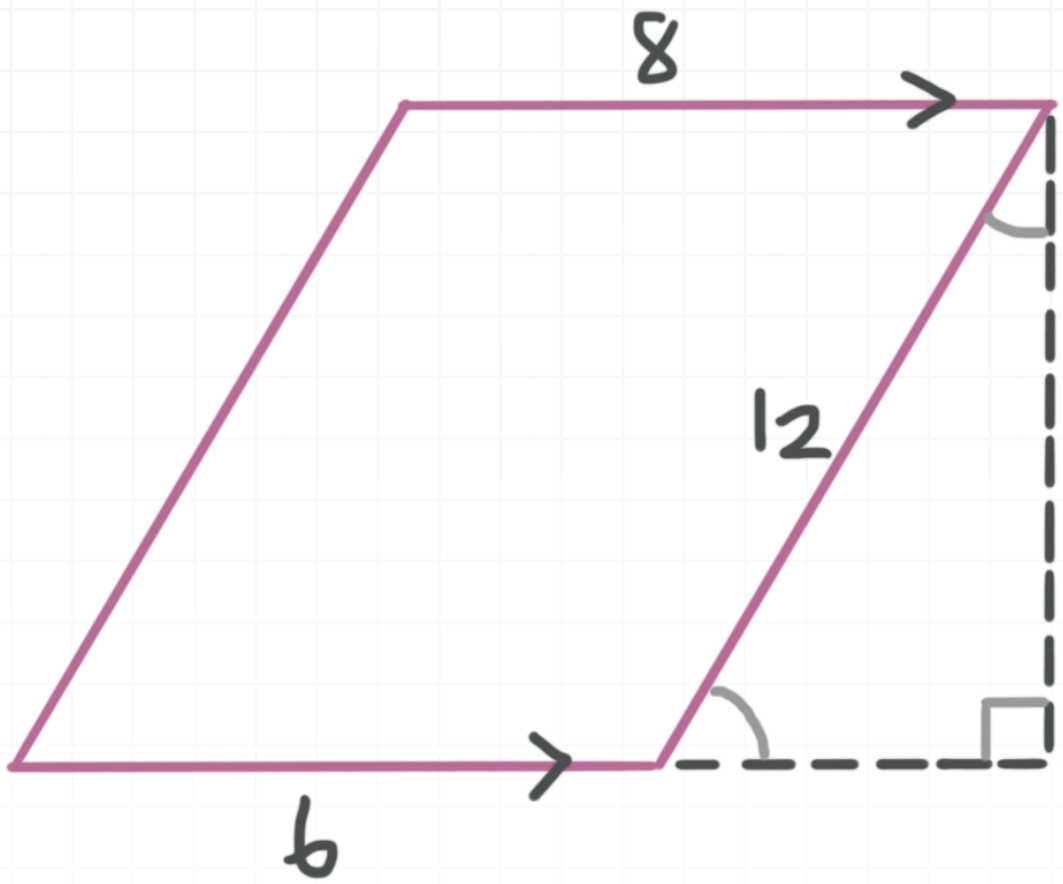
$$A = \frac{1}{2}(\text{height})(\text{base}_1 + \text{base}_2)$$

$$A = \frac{1}{2}(8)(16 + 10)$$

$$A = 104$$

■ 3. Find the exact area of the trapezoid.

© Krista King Math



Solution:

$42\sqrt{2}$. Find the height using $45-45-90$ rules for right triangles to see that the height is $h = 6\sqrt{2}$. Then the area of the trapezoid is

$$A = \frac{1}{2}(\text{height})(\text{base}_1 + \text{base}_2)$$

$$A = \frac{1}{2}\left(6\sqrt{2}\right)(6+8)$$

$$A = 42\sqrt{2}$$

© Krista King Math

■ 4. The area of a trapezoid is 60 m^2. One of the bases has a measure of 7 m and the height of the trapezoid is 10 m. Find the length of the other base.

Solution:

$b = 5$. We can plug what we know into the formula for the area of a trapezoid, and then solve for the length of the second base.

$$A = \frac{1}{2}(\text{height})(\text{base}_1 + \text{base}_2)$$

$$60 = \frac{1}{2}(10)(7 + \text{base}_2)$$

$$120 = 10(7 + \text{base}_2)$$

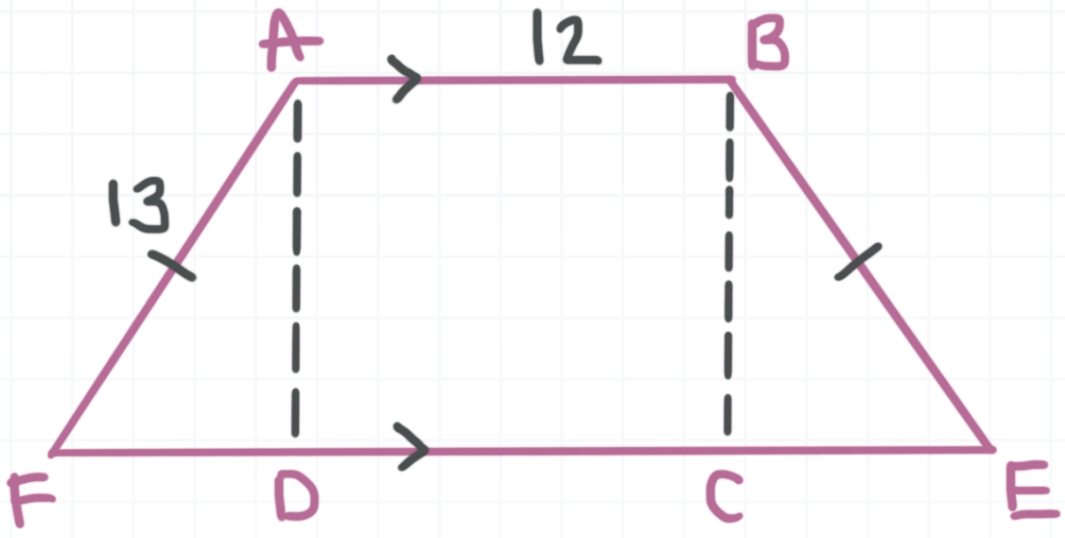
$$120 = 70 + 10\text{base}_2$$

$$50 = 10\text{base}_2$$

$$\text{base}_2 = 5$$

■ 5. Find the area of trapezoid $ABEF$, if $ABCD$ is a square.

© Krista King Math



Solution:

204. We know that $AB = AD$ because $ABCD$ is a square. The height of the trapezoid is 12. Use the Pythagorean Theorem to find FD and CE.

$$FD^2 + AD^2 = AF^2$$

$$FD^2 + 12^2 = 13^2$$

$$FD = 5 = CE$$

Then $\overline{FE} = 5 + 12 + 5 = 22$. Therefore, the area of the trapezoid is

$$A = \frac{1}{2}(\text{height})(\text{base}_1 + \text{base}_2)$$

$$A = \frac{1}{2}(12)(22 + 12)$$

$$A = 204$$

© Krista King Math

AREA OF A TRIANGLE

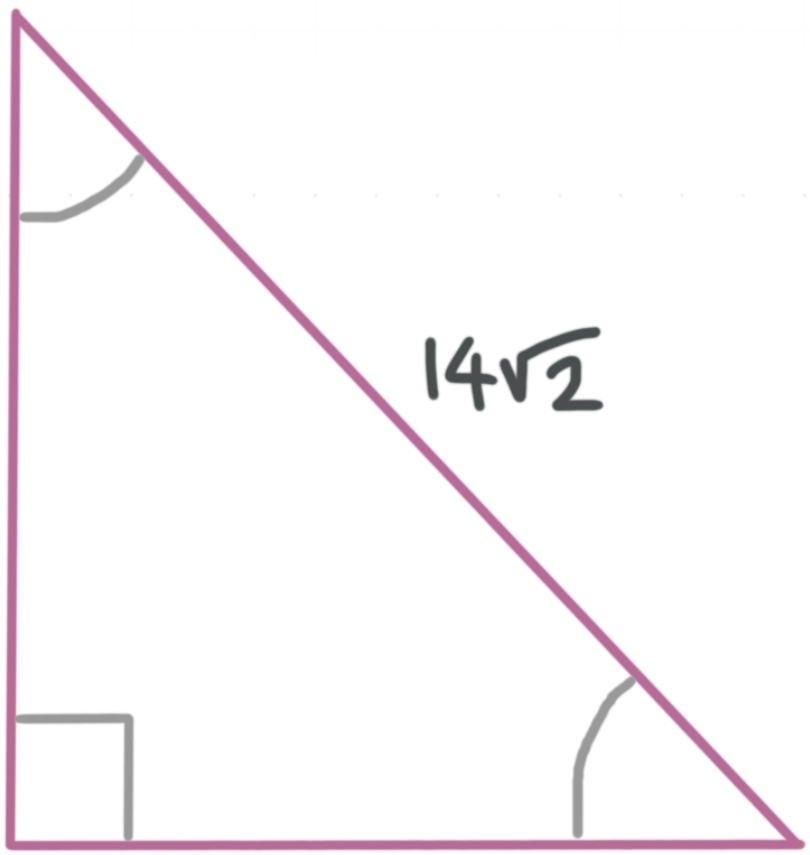
■ 1. Find the area of a triangle that has base length 16 and height 14.

Solution:

112. The area of the triangle is

$$A = \frac{1}{2}bh = \frac{1}{2}(16)(14) = 112$$

■ 2. Find the area of the triangle.



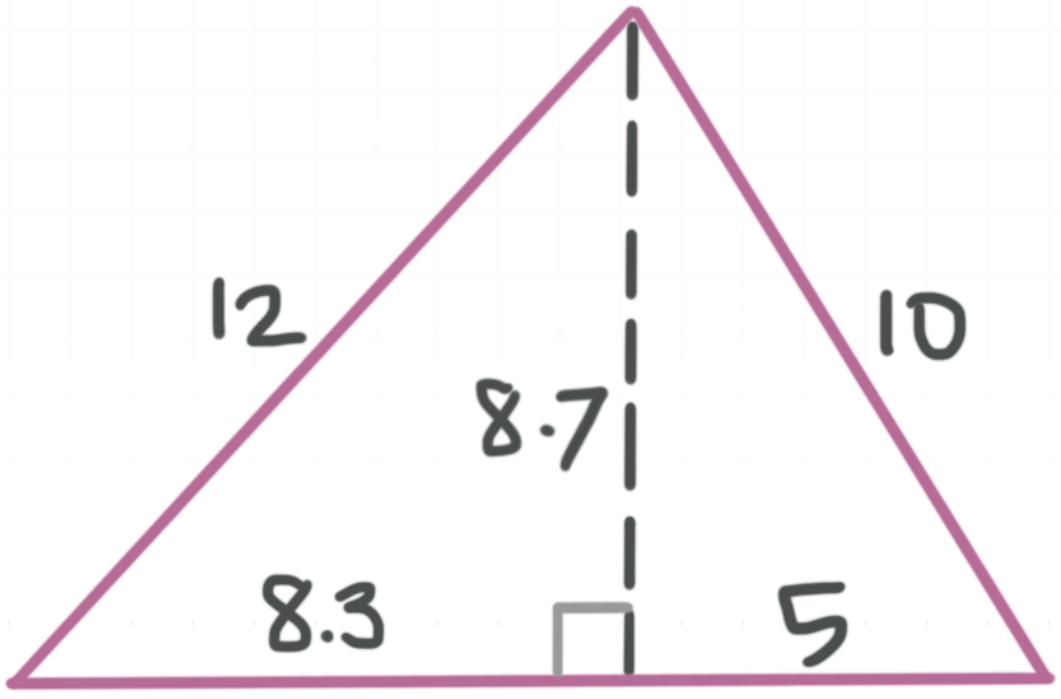
© Krista King Math

Solution:

98. Using $45-45-90$ rules, we find that the base of the triangle has length $b=14$ and height $h=14$. Then the area of the triangle is

$$A=\frac{1}{2}bh=\frac{1}{2}(14)(14)=98$$

■ 3. Find the area of the triangle.



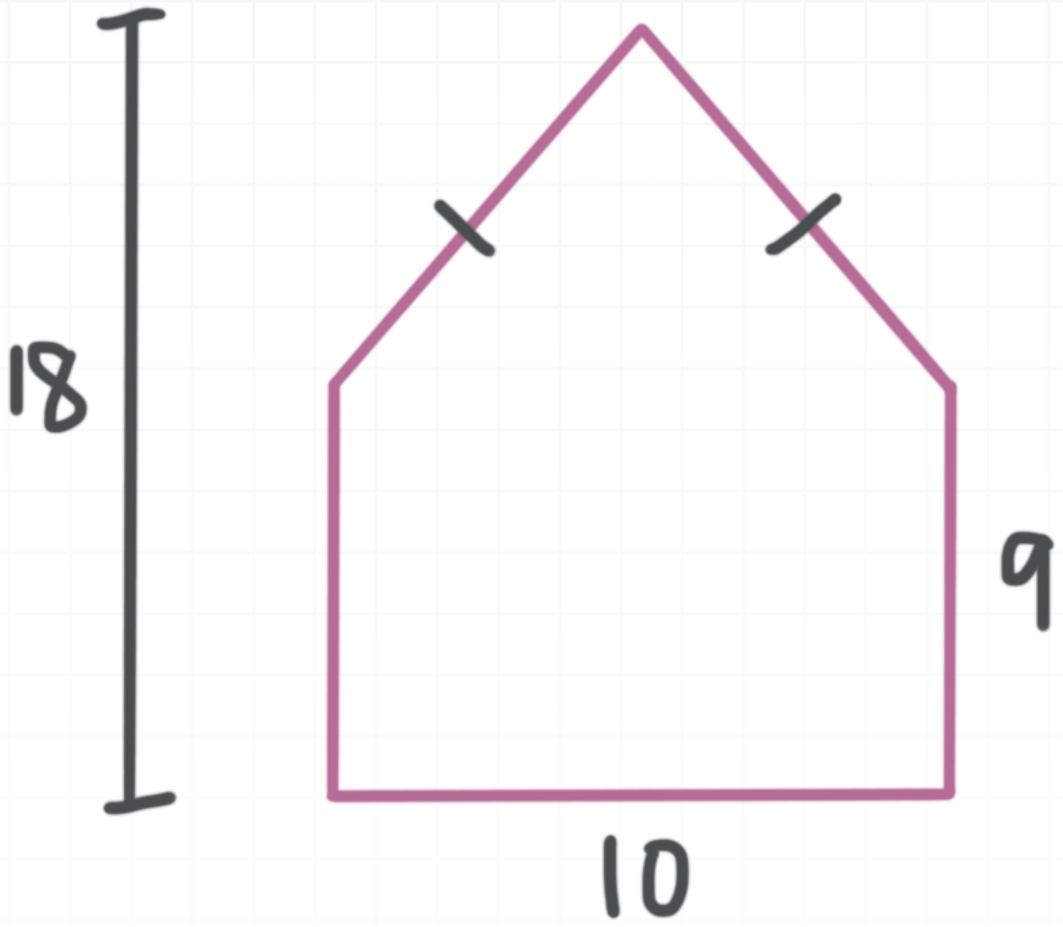
Solution:

57.855. The area of the triangle is

$$A=\frac{1}{2}bh=\frac{1}{2}(13.3)(8.7)=57.855$$

© Krista King Math

4. Find the area of the figure below.



Solution:

135. The area of the rectangle is

$$A_R = bh = (10)(9) = 90$$

The area of the triangle is

$$A_T = \frac{1}{2}(bh) = \frac{1}{2}(10)(9) = 45$$

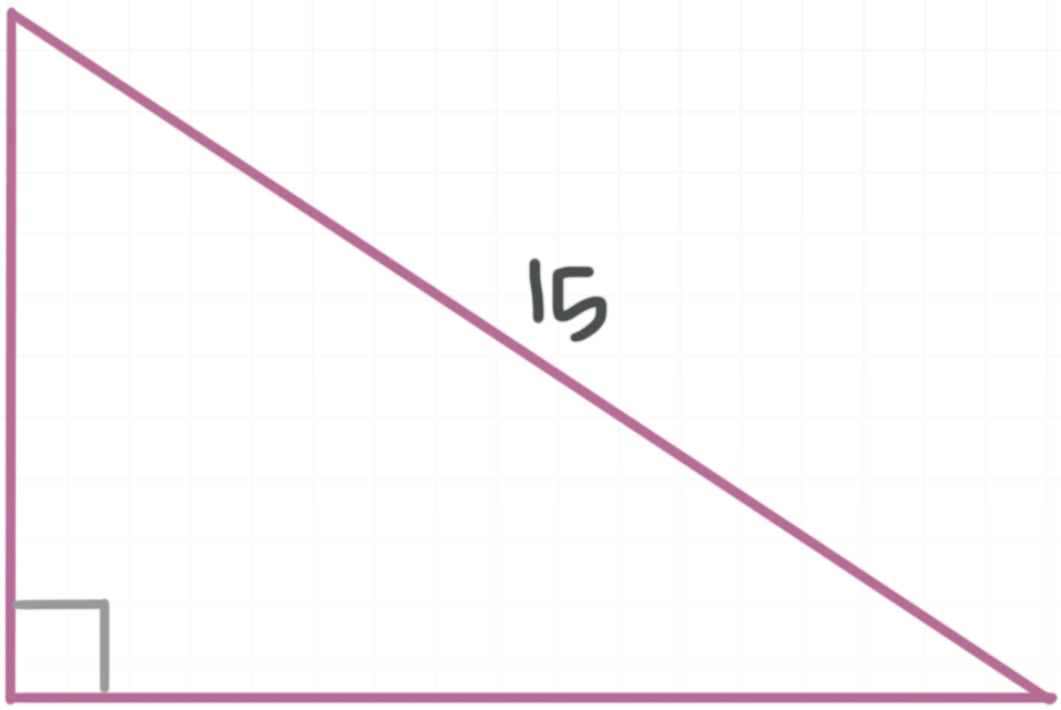
Therefore, the area of the entire region is

$$A = A_R + A_T = 90 + 45 = 135$$

© Krista King Math

FINDING PERIMETER USING THE PYTHAGOREAN THEOREM

1. Find the perimeter of the triangle.



Solution:

36. Let the missing side be x.

$$x^2 + 12^2 = 15^2$$

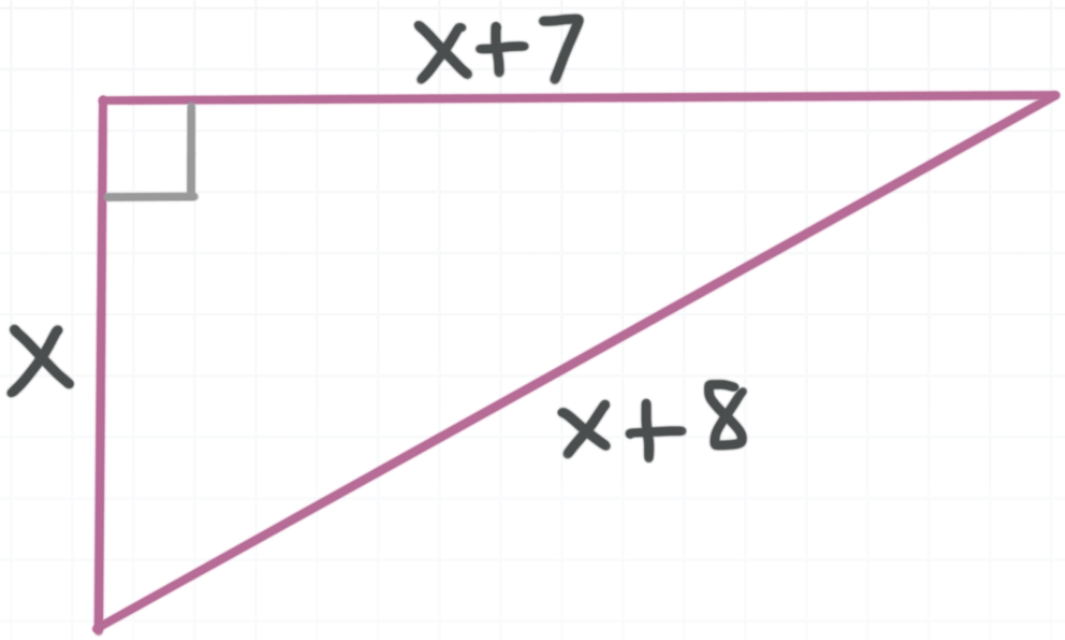
$$x^2 = 15^2 - 12^2 = 81$$

$$x = \sqrt{81} = 9$$

The perimeter of the triangle is $9 + 12 + 15 = 36$.

© Krista King Math

2. Find the perimeter of the triangle.



Solution:

30. The perimeter can be found by plugging the side lengths into the Pythagorean Theorem.

$$x^2 + (x + 7)^2 = (x + 8)^2$$

$$x^2 + x^2 + 14x + 49 = x^2 + 16x + 64$$

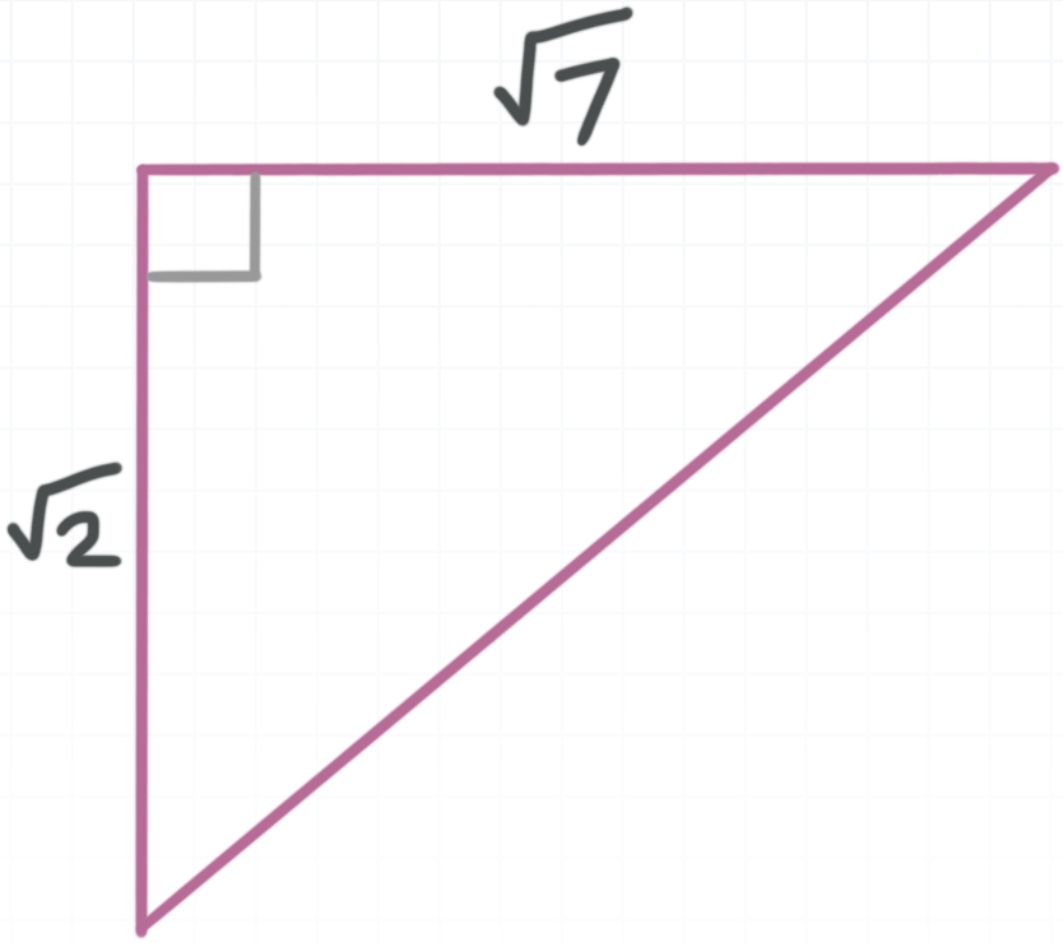
$$x^2 - 2x - 15 = 0$$

$$(x - 5)(x + 3) = 0$$

So $x = 5$ or $x = -3$. But one of the legs of the triangle is x, which means x cannot have a negative value, because that would mean we'd have a negative side length. Therefore, $x = 5$ and the side lengths must be 5, 12, and 13. Which means the perimeter of the triangle is $5 + 12 + 13 = 30$.

© Krista King Math

■ 3. Find the exact perimeter of the triangle.



Solution:

$\sqrt{2}+\sqrt{7}+3$. Plug the side lengths into the Pythagorean Theorem to find the length of the hypotenuse.

$$\left(\sqrt{2}\right)^2+\left(\sqrt{7}\right)^2=c^2$$

$$2+7=c^2$$

$$c^2=9$$

$$c=\sqrt{9}=3$$

© Krista King Math

Therefore, the perimeter of the triangle is $\sqrt{2}+\sqrt{7}+3$.

■ 4. Find the perimeter of a right, isosceles triangle, to the nearest hundredth, in which one of the legs measures 5 inches.

Solution:

17.07 inches. Draw a right, isosceles triangle and note that both legs must be 5 inches long. Find the hypotenuse using the Pythagorean Theorem.

$$c^2 = 5^2 + 5^2$$

$$c^2 = 50$$

$$c = \sqrt{50} = 5\sqrt{2}$$

Then the perimeter is

$$P = 5 + 5 + 5\sqrt{2} = 10 + 5\sqrt{2} = 10 + 7.07 \approx 17.07 \text{ inches}$$

© Krista King Math

AREA OF A CIRCLE

■ 1. Find the area of a circle to the nearest hundredth with a diameter of 44 inches.

Solution:

1520.53 in^2. If the diameter is 44 inches, then the radius is half that: 22 inches. Plug the radius into the formula for the area of a circle.

$$A = \pi r^2$$

$$A = \pi(22)^2$$

$$A = 1{,}520.53$$

■ 2. The area of a circle is 300 cm^2. Find the length of the radius to the nearest tenth of a centimeter.

Solution:

9.8 cm. Plug the area into the formula for the area of a circle, and then solve for the radius, r.

$$A = \pi r^2$$

© Krista King Math

$$300 = \pi r^2$$

$$r^2 = \frac{300}{\pi} = 95.5$$

$$r = \sqrt{95.5} = \approx 9.8$$

■ 3. Find the exact area of a circle with a circumference of 18π.

Solution:

81π. Plug the circumference into the formula for the circumference of a circle.

$$C = d\pi$$

$$18\pi = d\pi$$

$$d = 18$$

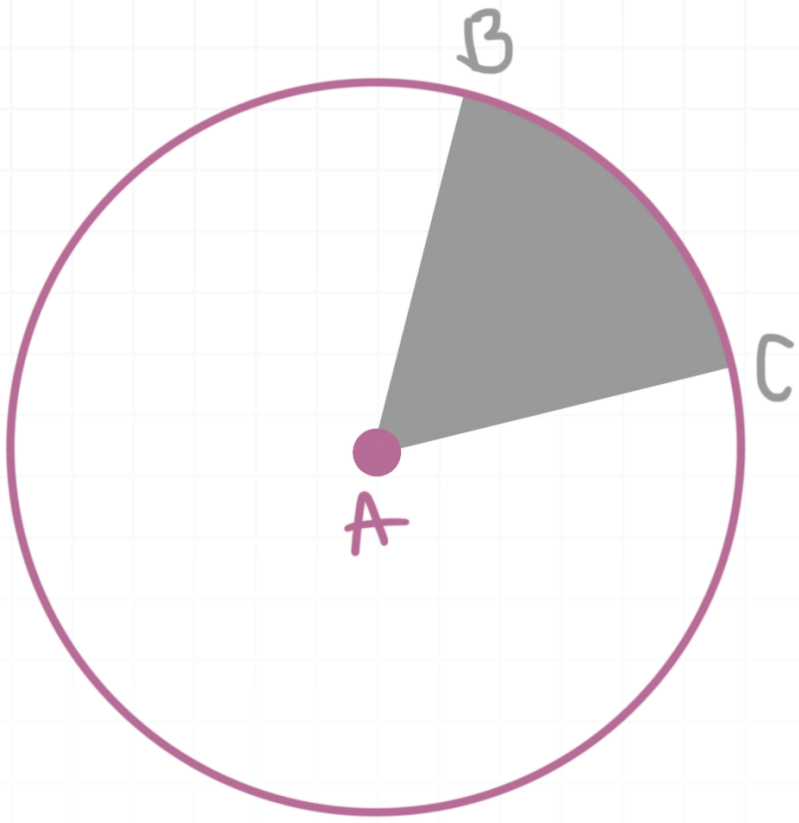
Because the diameter has length 18, the length of the radius is $r = 9$. Therefore, the area of a circle is

$$A = \pi(9)^2$$

$$A = 81\pi$$

© Krista King Math

■ 4. Find the area of the shaded region to the nearest tenth if $m\angle BAC = 60°$ and $AC = 16$ feet.



Solution:

804.2 ft^2. The shaded area represents $60/360$, or $1/6$ of the total area. The area of the shaded region is

$$A = \pi r^2 = \frac{1}{6}\pi(16)^2 = 804.2$$

© Krista King Math

CIRCUMFERENCE OF A CIRCLE

■ 1. To the nearest hundredth, find the circumference of a circle that has a radius of 14 feet.

Solution:

87.96 ft. The circumference of the circle is

$$C = 2\pi r = 2\pi(14) = 28\pi \approx 87.96$$

■ 2. Find the area of a circle with a circumference of 400 ft.

Solution:

$12{,}731.61$ ft^2. We can use the formula for circumference.

$$C = 2\pi r$$

$$400 = 2\pi r$$

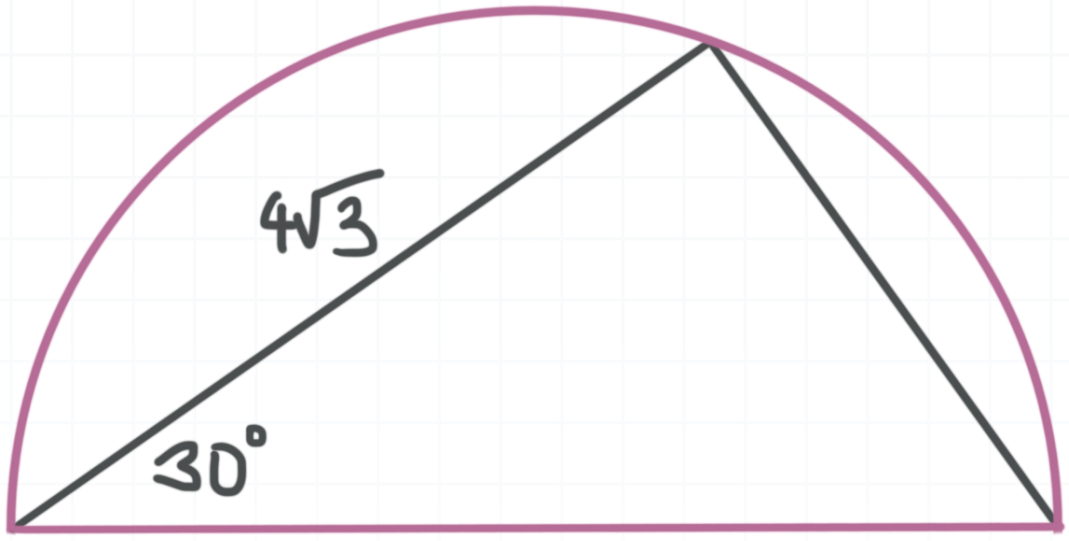
$$r = \frac{200}{\pi} \approx 63.66$$

Then the area of the circle is

$$A = \pi(63.66)^2 \approx 12{,}731.61$$

© Krista King Math

■ 3. Find the exact circumference of the semicircle.



Solution:

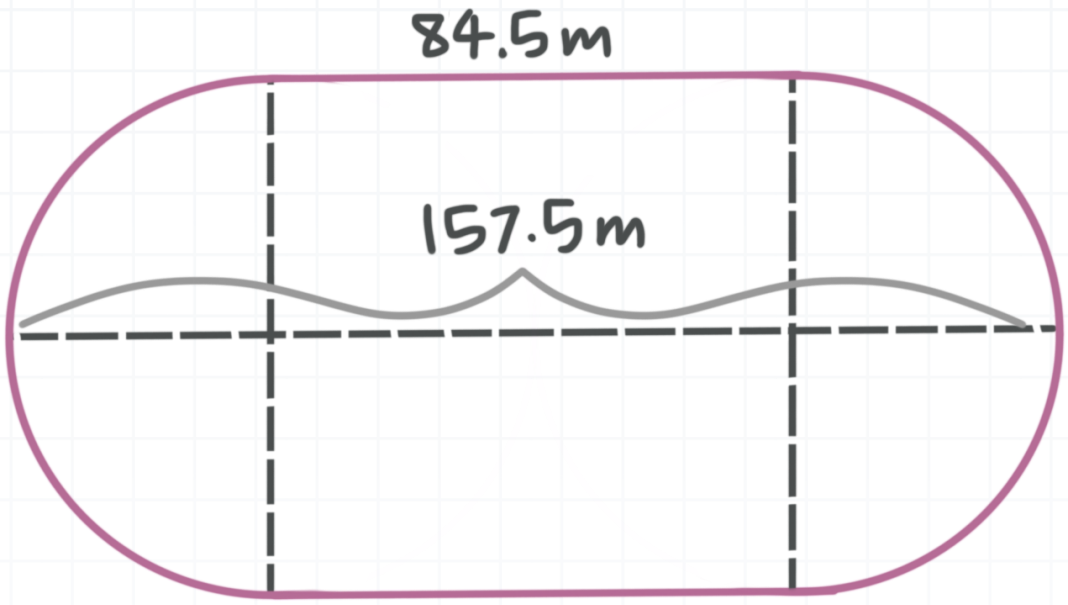
4π. Find the diameter of the circle using $30-60-90$ rules to find $d=8$.

$$C=2\pi r=d\pi=8\pi$$

The semicircle has a circumference that is half of the overall circumference of the circle.

■ 4. To the nearest tenth, find the distance around the following track.

© Krista King Math



Solution:

398.3 m. The length is comprised of two straight stretches and two semicircles. The length of the radius of each semicircle must be

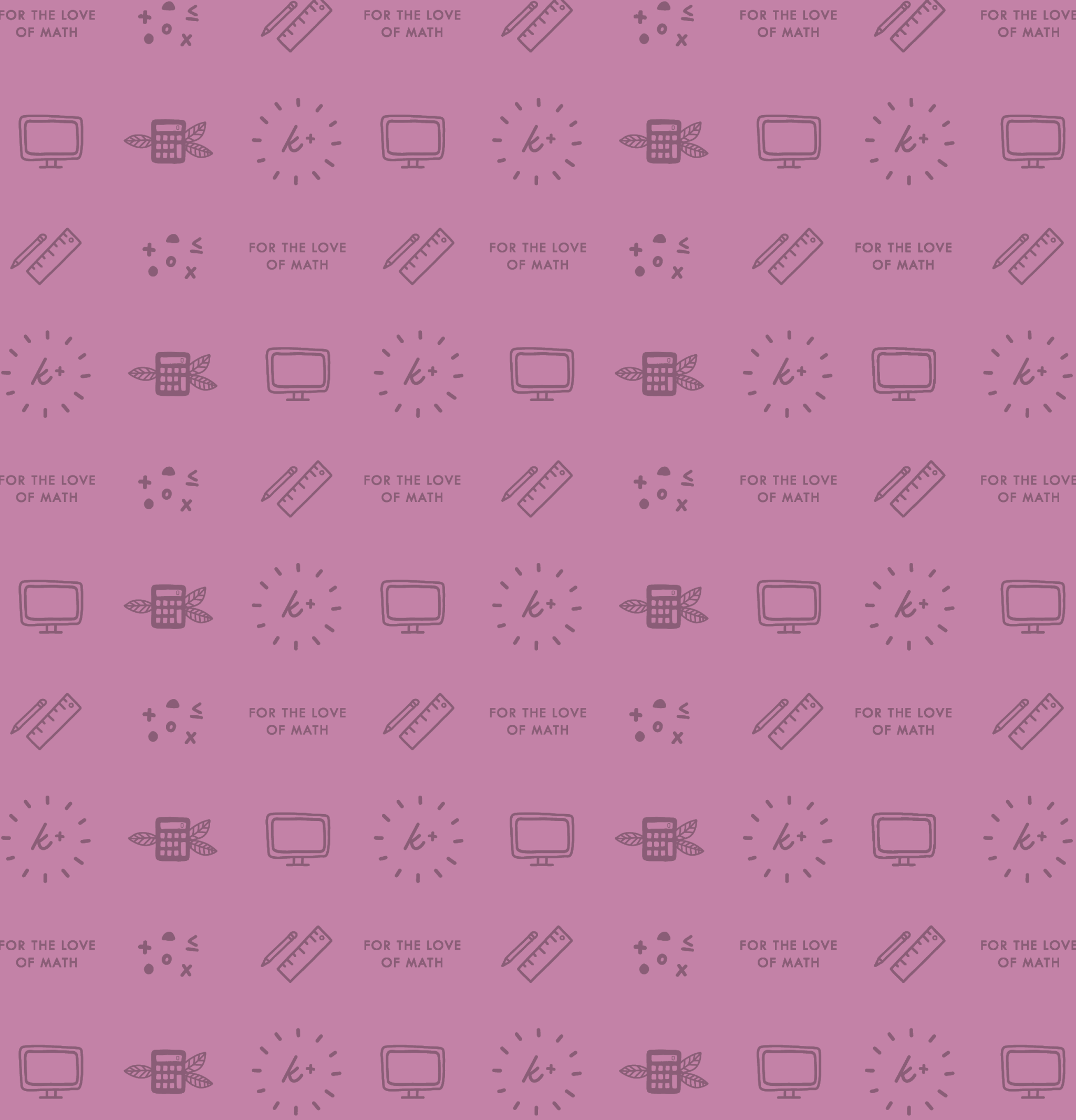
$$\frac{(157.5 - 84.5)}{2} = 36.5$$

The circumference of each semicircle is

$$\frac{1}{2}(2)(36.5)\pi \approx 114.67$$

$84.5 + 84.5 + 114.67 + 114.67 = 398.3$ meters

© Krista King Math



WWW.KRISTAKINGMATH.COM